

## Lightning-fast mill zaps mold shop's backlog

(by Leo R. Rakowski, Contributing Editor)

### *Two hybrid VMCs make fast work of EDM electrode machining.*

Is your mold shop's electrode-machining operation so slow that it's bottlenecking your EDMing department? Here's how Reddog Industries, Inc., a large mold design and manufacturing firm in Erie, PA, solved the problem.

"About 85 percent of our machine tools are CNC machines, and we're very efficient when it comes to machining mold steels," explained William M. Hilbert, Jr., vice president and general manager of the firm. "We would move mold cores and cavities from one machine tool to another on schedule, only to have things come to a halt at our CNC sinker EDMs because the EDM electrodes for the jobs were not ready. Our electrode-machining operations were not keeping pace with production."

These Evolution Series machining centers, which combine the Creative Evolution CNC, a control developed specifically for high-speed milling of 3D shapes, with the Haas vertical machining center, eliminated Reddog Industries' EDM electrode backlog. Reddog vice president and general manager William M. Hilbert, Jr. (at left in photo) expects that the machines will help shave mold delivery times dramatically.



Reddog's CNC milling department includes a large bank of vertical machining centers (VMCs) used to finish-machine large mold components. "We used one of the VMCs to machine EDM electrodes exclusively, but frequently the one machine wasn't enough," Hilbert explained.

"Most of our electrodes have complex 3D shapes, and the finishing mill could only cut those shapes at feed rates of 10 to 15 ipm," he continued. "When we tried to increase the feed rates, the machine would either skip some points, resulting in an incorrectly machined electrode, or the machine would periodically come to a halt because the system couldn't crunch the numbers fast enough."

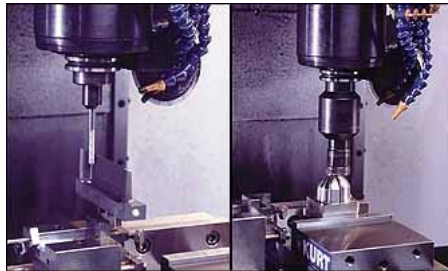
The problem affected fundamental decisions about how to process the molds. "Our electrode production was so slow that we decided to mill delicate details, corners, deep cavities...features that we would have preferred to EDM," Hilbert continued. "We have a sizeable investment in modern CNC sinker EDM machines, and we wanted to make full use of their productive potential. The best solution to our problem seemed to be to find a faster way to machine our EDM electrodes."

As a result of Reddog Industries' investigation into high-speed milling, it discovered the Creative Evolution CNC, a PC-based, open-architecture, machine tool control developed specifically for 3D milling applications by Creative Technology Corp., Arlington Heights, IL. The Creative Evolution control combines the fastest block cycle and servo cycle times in the industry with an automatic, dynamic, look-ahead capability. The combination optimizes the performance of the host machine, enabling it to cut even difficult 3D shapes as fast as the physical limitations of the machine permit without violating the cutter path. Users have reported three- to ten-fold improvements in effective cutting speeds simply by substituting the Creative Evolution control for the machine's original CNC.

Reddog decided to retrofit the Creative Evolution control on one of its finishing mills on a coexisting basis with the machine's original control. The Creative Evolution CNC directs all of the machine's axis moves, while the original control continues to govern tool changes, coolant flow and similar basic functions.

The retrofitted control improved the performance of the machine--faster feed rates and better machined finishes--to such an extent that its slow (2500-rpm) spindle speed became a serious limitation. Accordingly, a high-speed milling head was added that enables the machine to run small-diameter cutters at high rpms.

"With the small-diameter cutters we can make finer cuts with smaller step-overs," Hilbert explained. "Because of the finer step-overs, our tool paths are much longer with the Creative Evolution control, but the control has at least doubled our cutting speeds, so we finish the job as fast or faster and our cuts are much smoother."



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Hilbert was equally impressed with the control's mid-file start feature: "We can start the program at any point," he enthused. "If a cutter breaks or wears out, instead of having to start the program from the beginning, we can resume where the interruption occurred. That's a great time saver."

However, the improvements still did not provide the firm with the electrode-machining solution it needed. For one thing, use of even one of the finishing mills for electrode machining reduced the number of machines available for finish milling of steel mold components. Reddog started thinking in terms of a new machine, made especially for electrode machining, that would be located near the EDM department instead of the machining department.

The shop explored the dedicated electrode mills available. It was impressed by their performance claims but appalled by their price tags. About that time, Barney Machinery Co., Pittsburgh, PA, a machine tool distributor that represents Creative Technology in the Pittsburgh and Erie areas, and that sold Reddog the Creative Evolution control for its finishing mill, came up with a great idea.

Barney Machinery also represents Haas Automation, Inc., Oxnard, CA, manufacturer of the well-regarded Haas vertical and horizontal machining centers and other machine tools. Barney serves a large number of tool, die and mold shops, many of which machine EDM electrodes for die and mold-making applications.

Why not, the firm wondered, combine the Haas machining center with the Creative Evolution control to make a CNC mill capable of high-speed 3D machining of graphite *and* steel, yet priced well below the cost of most dedicated electrode mills?

Barney Machinery approached Creative Technology and Haas with the idea and obtained permission to offer the Creative Evolution control in place of the OEM control on new Haas machining centers sold to shops that intended to use them primarily for 3D machining. Barney named its hybrid the Evolution Series Machining Center.

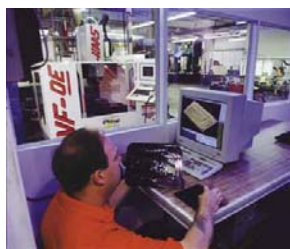
Reddog was so impressed by demonstrations of the Evolution Series machine that it bought one for installation in August, 1997, and a second unit for installation six weeks later. Both Evolution Series machines are built on the VF-0E, a Haas 15-hp, direct-drive VMC with a 10,000-rpm spindle. Each machine is equipped with a dust collector and thermal growth compensation. Each was up and running the day it was delivered.

The two Evolution Series machines, arranged side by side in the EDM department, handle all of the shop's electrode requirements. "These two machines can machine a volume of electrodes that previously required as many as four machines," explained Jeff Wells, their programmer/operator. "Actually, only one of the Evolution machines runs graphite exclusively. The other also machines small steel parts.

"On the old machines, the fastest we could cut was 10 to 15 ipm," Wells continued. "Now, we're machining electrodes at 200 to 300 ipm. For some applications, say, machining a profile with a ball nose end mill, we've run at 400 to 500 ipm. Because the Evolution machines are so fast, we can program smaller stepovers for machining, achieve better finishes on the pieces as a result, and still be finished much faster than before." he added.

Hilbert identified still another benefit of taking finer cuts: "Many of our electrodes are glued," he explained. "If you apply too much force with the cutter, you can knock off the glued piece and lose all of the time and effort that went into making the blank.

"The Evolution Series machines are not only fast but accurate," Hilbert stressed. "They have a look-ahead capability and one of the fastest data processing capabilities in the industry. That combination enables the machines to always operate at the highest cutting speed that will not compromise the accuracy of the cutter path. Think of it as a race car going around a track as fast as possible, with a computer constantly making all of the adjustments that a race-car driver would need to make to keep the car on the track, except many more times per second."



**Jeff Wells, operator and programmer for the two Evolution machines, prepares a machining program for one of the machines in the relative quiet of a portable office located near the machines.**

Hilbert explained how the Evolution machines affect the big picture at Reddog: "First, because the Evolution machines provide all of the electrode-machining capacity that we need, all of the finish mills are machining steel again, which has increased the capacity of that part of our operation. Second, the ability of the Evolution machines to machine graphite *and* steel provides a production flexibility missing in smaller, less powerful electrode mills," he noted.

"Before, because it took so long to machine the electrodes, we machined details in the mold where possible rather than EDM them," Hilbert continued. "Now, in situations where we have a choice, we can specify the preferred EDM process without having to worry about waiting for the electrodes. With the Evolution machines, our electrode-making operation is so efficient that we have eliminated our backlog."

"Most of our production decisions are customer-driven," Hilbert emphasized. "The customer wants his die or mold as quickly as possible, and everything that we do is done with the idea of reducing the time required to design the product, design the mold, produce the mold and get the product to market."

"Years ago, delivery times of 22 to 24 weeks were common for a fairly large, complicated mold," Hilbert continued. "By adding modern, more efficient equipment and procedures, we have slashed our lead times dramatically."

"High-speed milling is one of the technologies that will help us to reduce lead times further," he added. Improvements in the CNC milling department will serve the firm's long-term interests in two ways: first, the department will become an even more efficient supplier to the EDM department; secondly, as improvements in milling technology occur that swing the pendulum away from EDMing and toward greater use of milling in mold production, the shop will be positioned to use those improvements to competitive advantage."



**The Creative Evolution CNC, retrofitted to one of Reddog Industries' finishing mills, directs the machine's axis movements through finish machining of this container lid cavity. It was installed on a coexisting basis with the machine's original control.**

Hilbert confided that within the next 12 months, he hopes to add Creative Evolution controls to the shop's nine other CNC finishing mills. As those machines become obsolete over time, he expects to replace them with new Evolution VMCs.

We asked Hilbert if he had any reservations about buying a hybrid machine that did not have a proven track record. "Barney Machinery has been our machinery consultant for years," Hilbert replied. "They know our needs and we trust their judgment."

"Secondly, the Haas VMC is a great machine tool," he continued. "It's a well-made machine at a very competitive price. At the same time, the Creative Evolution control is an excellent machine tool control for 3D milling applications. It seemed like an excellent marriage."

"It may seem like we were taking a chance, but companies like Haas and Creative Technology represent the future of machining," Hilbert emphasized. "Haas builds a lot of machines, but they're flexible, they listen and they're willing to do whatever we ask within reason. Creative Technology is the same way. They're out to produce the best 3D milling control. They listen to their customers and continuously improve their product. The bottom line is a faster, more efficient machine ideally suited to our 3D machining needs."

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